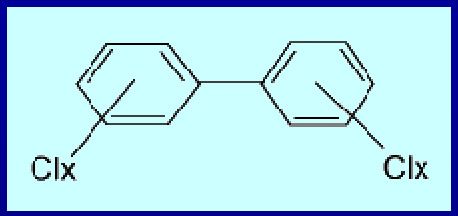
- Informational Meeting -

PCB Monitoring for TMDL Development on the Tidal James River Watershed



Mark Richards

Mark.richards@deq.virginia.gov

October 19, 2010

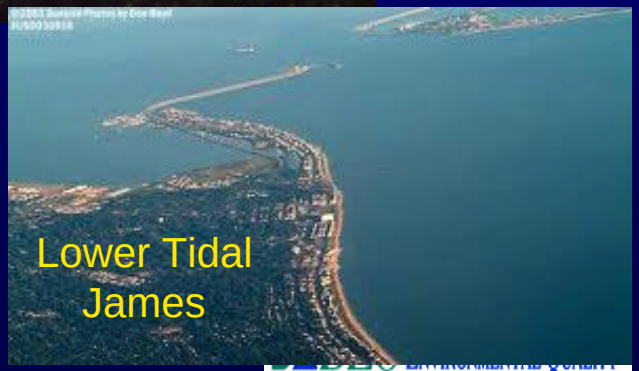
DEQ Virginia Department of Environmental Quality

Meeting Overview - PCBs

- Background
  - What is a TMDL?
- Why do we care about PCBs?
  - Legacy Pollutant
- Spring 2009/2010 Study
- TMDL Development/ Challenges
- PCB Point Source Guidance


Richmond


Middle Tidal James


Lower Tidal James

DEQ
VIRGINIA DEPARTMENT OF ENVIRONMENTAL QUALITY

Tidal James River Watershed

DEQ Virginia Department of Environmental Quality

What is a TMDL?

TMDL = Total Maximum Daily Load =

maximum amount of a pollutant that can exist in a waterbody without violating water quality standards (WQS)

WQS = numeric or narrative limits on pollutants that ensure the protection of human health and of aquatic life

DEQ Virginia Department of Environmental Quality

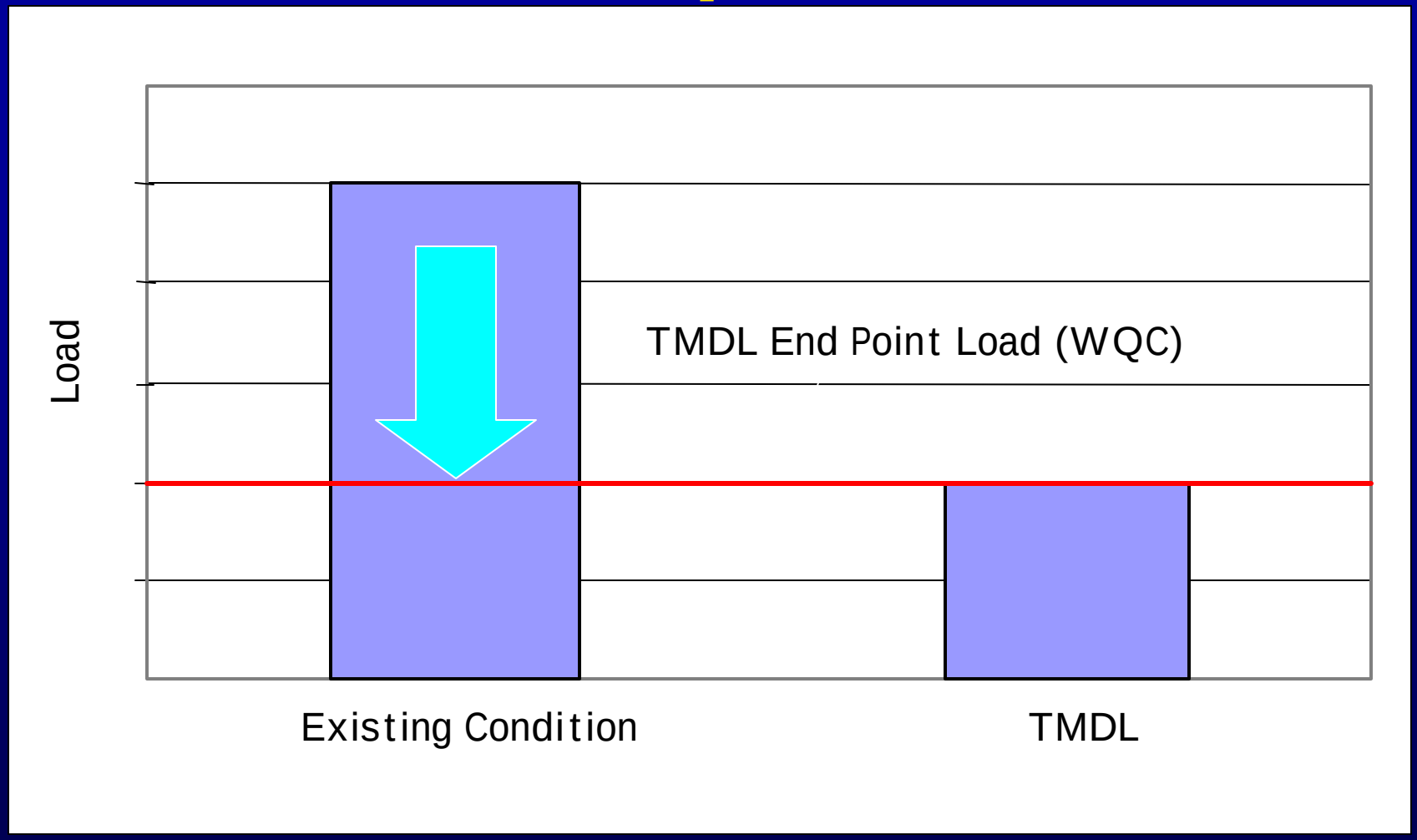
Why are TMDL studies necessary?

- Federal & State Laws
  - 1972 Clean Water Act (section 303d)
  - 1997 Water Quality Monitoring, Information and Restoration Act (WQMIRA)
  - 1999 Consent Decree (American Canoeist Association Lawsuit)
- Required in waterbodies where WQC not met for applicable designated use
  - Designated Uses
    - Primary Contact (Swimming), Aquatic Life, Fish Consumption, Public Water Supply, Shellfish consumption

~ 1,100 TMDLs due by 2022

DEQ Virginia Department of Environmental Quality

An Example TMDL



Reducing existing pollutant load to the TMDL end point load is expected to restore water quality

DEQ Virginia Department of Environmental Quality

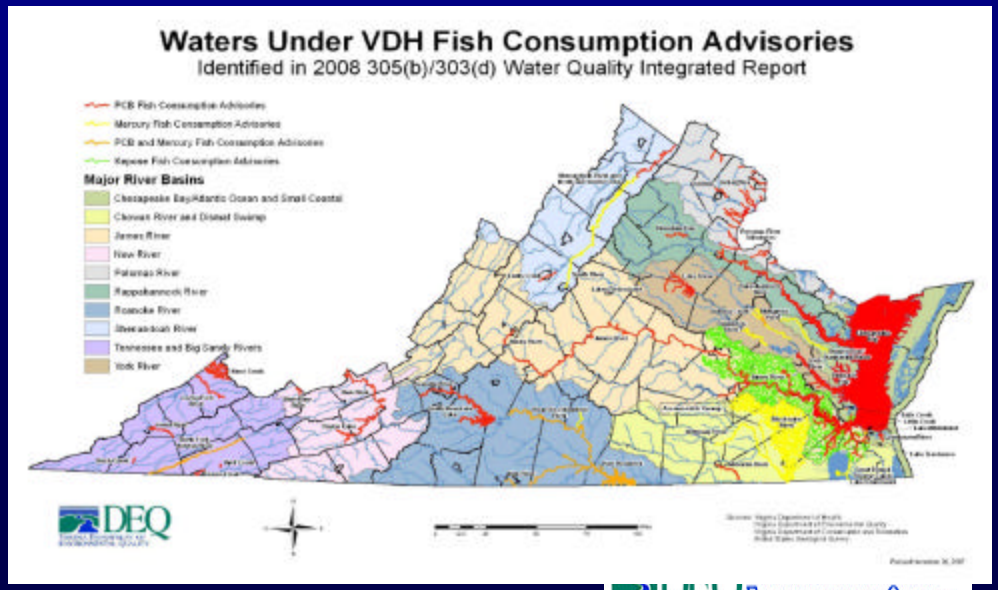
TMDL Development for the Tidal James River Watershed

Presentations and Handouts Available at:
http://www.deq.virginia.gov/tmdl

DEQ PCB Website:
http://www.deq.virginia.gov/tmdl/pcb.html

DEQ Fish Tissue Monitoring

- PCBs Persistent
  - Tend to accumulate in sediments and tissue
- Monitor to assess the “Fishable” Goal of Clean Water Act
- Fish trigger value
  - VDH changed from 600 ppb to 50 ppb (2004)



DEQ Environmental Quality

VA Regulatory Criteria
Total PCBs

	Consumption Advisories Fish Tissue (ppb)	Water Quality Criterion (ppb)
VDH	50	0.00064

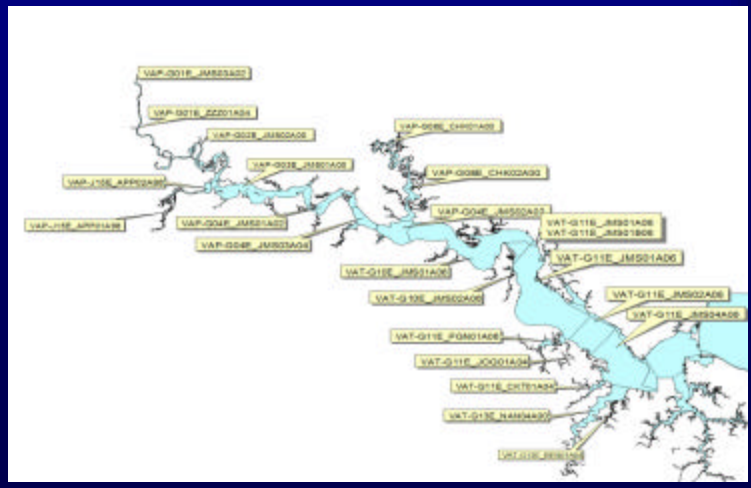
WQC represents target concentration in the water column that minimizes the bioaccumulation of tPCBs in fish to be protective of consumption (by humans)

DEQ Virginia Department of Environmental Quality

James River Fish Consumption Advisory (VDH) for PCBs

- I-95 bridge in Richmond downstream to Hampton Roads Bridge Tunnel
  - Includes Chickahominy to Walker's Dam, Skiffes Crk., Pagan and Nansemond Rivers + tributaries

Fish Species	Advisory
Gizzard Shad, Carp, Blue Catfish & Flathead Catfish ≥ 32 inches	Do Not Eat
Blue Catfish & Flathead Catfish < 32 inches, Channel Catfish, White Catfish, Largemouth Bass, Bluegill Sunfish, American Eel, Quilback Carpsucker, Smallmouth Bass, Creek Chub, Yellow Bullhead Catfish, White Perch, Striped Bass, Hickory Shad	No more than two meals/month

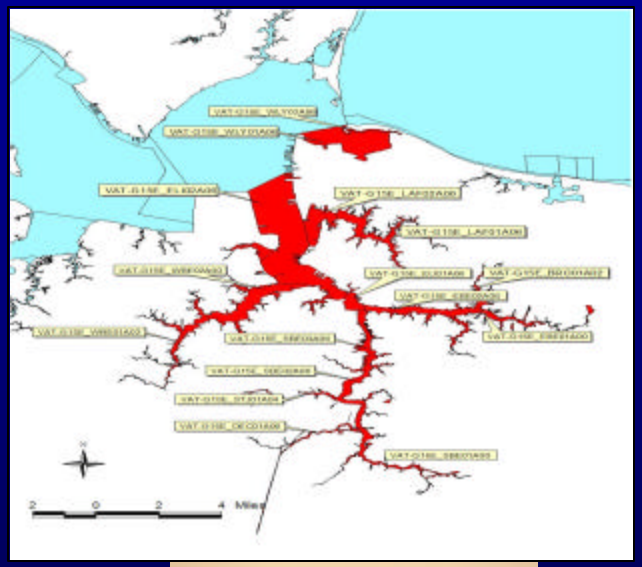


DEQ Virginia Department of Environmental Quality

Elizabeth River Fish Consumption Advisory (VDH) for PCBs

Willoughby Bay and the Elizabeth River system (Western Br., Eastern Br., Southern Br., and Lafayette River) and tidal tributaries St. Julian Creek, Deep Creek, and Broad Creek

Fish Species	Advisory
Gizzard Shad, Carp, Blue Catfish & Flathead Catfish ≥ 32 inches	**Do Not Eat**
Blue Catfish & Flathead Catfish < 32 inches, Channel Catfish, White Catfish, Largemouth Bass, Bluegill Sunfish, **American Eel**, Quilback Carpsucker, Smallmouth Bass, Creek Chub, Yellow Bullhead Catfish, **White Perch**, **Blueback Herring**, **Striped Bass**, Hickory Shad, **Croaker, Spot, Bluefish**	**No more than two meals/month**



Southern Branch of the Elizabeth River and its tidal tributaries

DO NOT EAT crab's hepatopancreas ("mustard," green gland, tomalley). Only applies to eating the "mustard". Crab meat is not subject to this advisory

DEQ Virginia Department of Environmental Quality

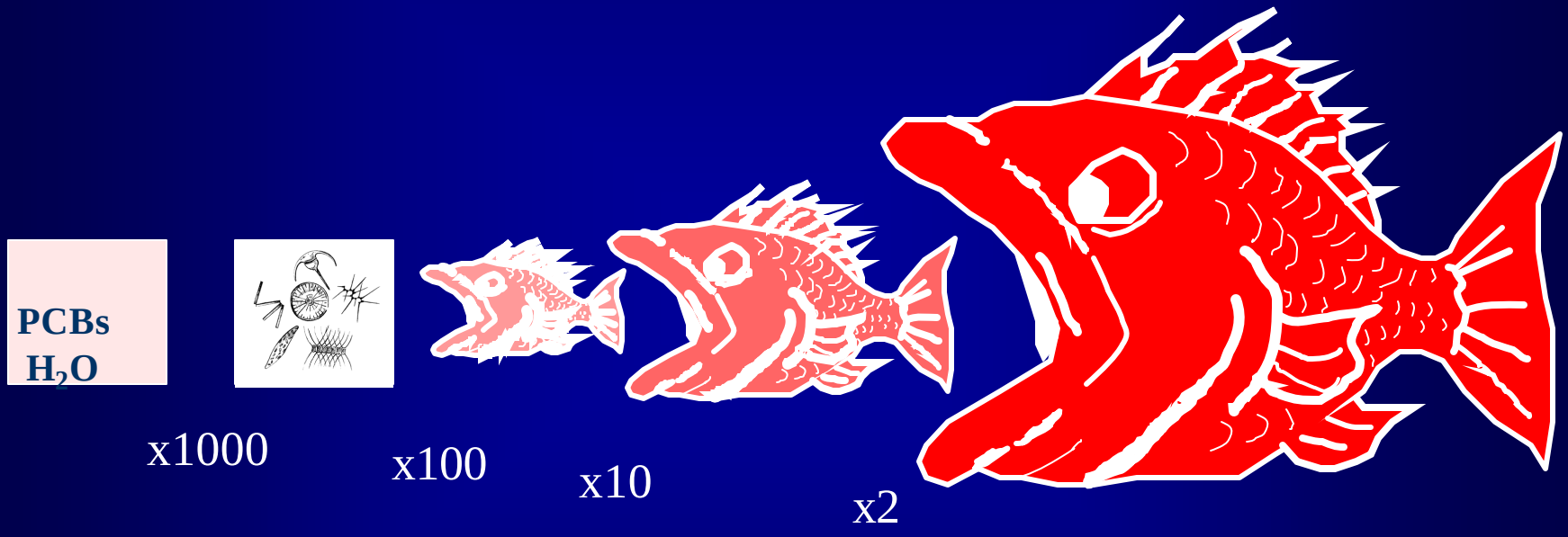
How Are Fish Exposed To PCBs?

- Intake through gills from water column
  - Basis of existing WQC (1980 EPA guidelines)
- Ingestion of contaminated sediment
  - Indirect uptake from foraging

- Exposure through skin from contaminated sediment (e.g. catfish)
- Ingestion of prey
  - Biomagnification

DEQ Virginia Department of Environmental Quality

Biomagnification

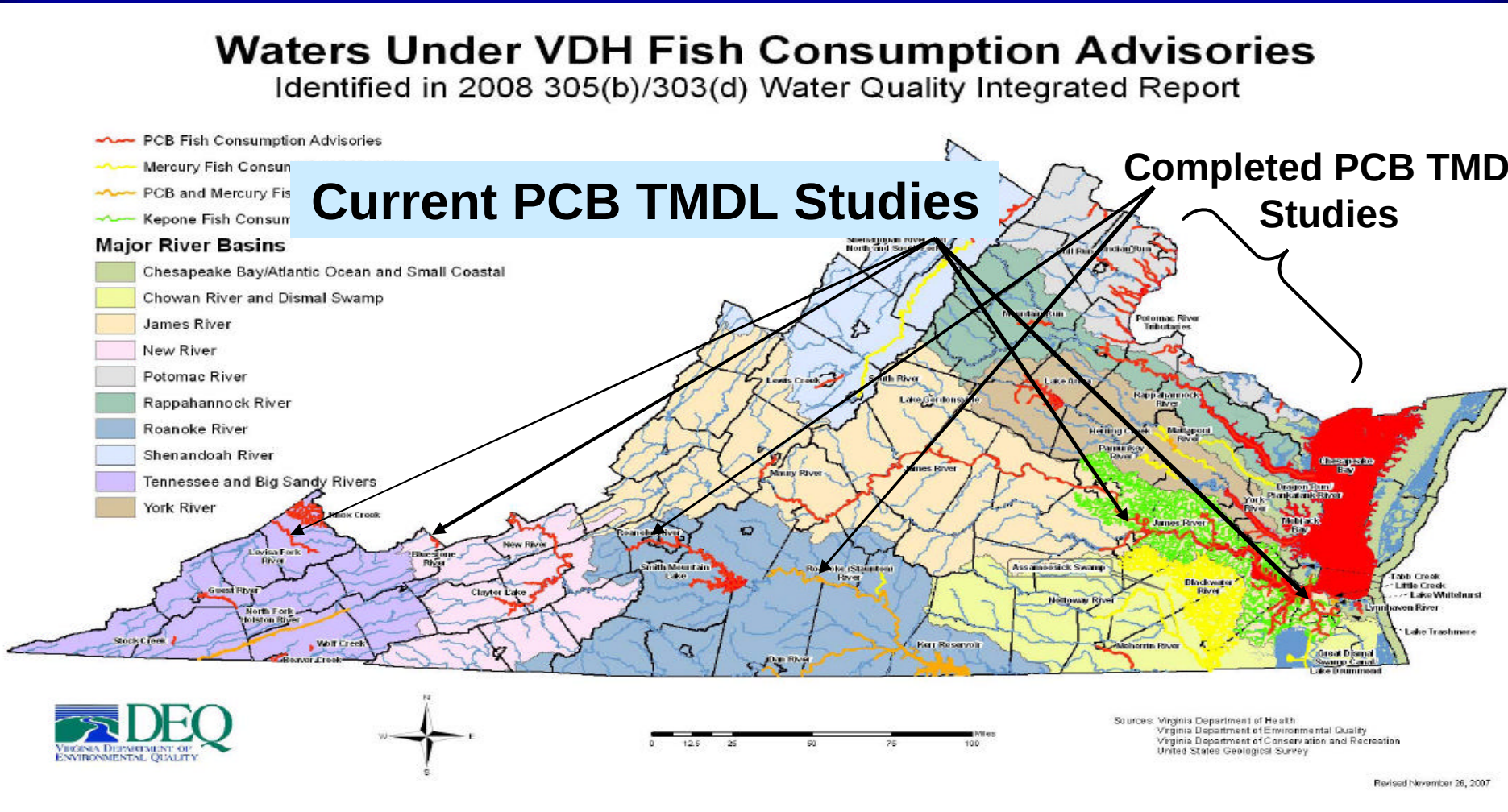


Concentration (parts per quadrillion)

1 1000 100,000 1,000,000 2,000,000

DEQ Virginia Department of Environmental Quality

Fish Consumption Advisories
- TMDL Required -

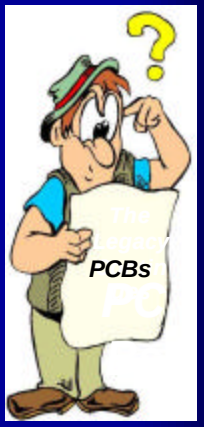


PCBs

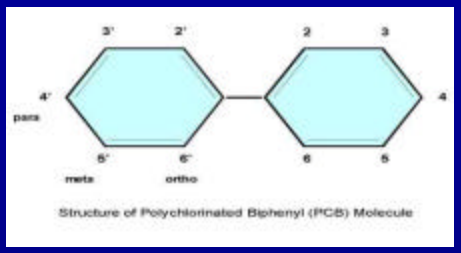
- Estimated that > 1.5 Billion lbs. manufactured in the U.S. until 1977 - “Legacy Contaminant”
- Very stable and heat resistant
  - Persistent in environment
- Common uses:
  - Transformers, capacitors, hydraulic fluids, circuit breakers, PVC Products, carbonless copy paper, caulking material, paints, etc.

DEQ Virginia Department of Environmental Quality

PCBs – What are They?



- Biphenyl molecule (1-10 chlorine atoms)



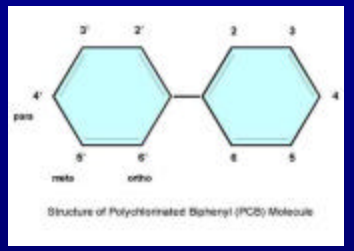
- 209 distinct PCB Compounds
- Regulated by VADEQ as Total PCB (tPCB) = 209 compounds summed
- Referred to as PCB Aroclors (Monsanto tradename) = mixture of PCB compounds

DEQ Virginia Department of Environmental Quality

PCBs – Why Important?

- Bioaccumulates at low conc. (lipids)
- Suspected carcinogen
- Other toxicological effects (humans)
  - Immunotoxicity, reproduction and developmental, hepatotoxicity (liver), neurotoxicity, and chloracne
- Major Sources of Exposure (humans)
  - Consumption of contaminated fish
  - Inhalation (dust from contaminated sites)

WQC = 0.00064 ug/L



Structure of Polychlorinated Biphenyl (PCB) Molecule

DEQ Virginia Department of Environmental Quality

PCBs - A Legacy Pollutant?

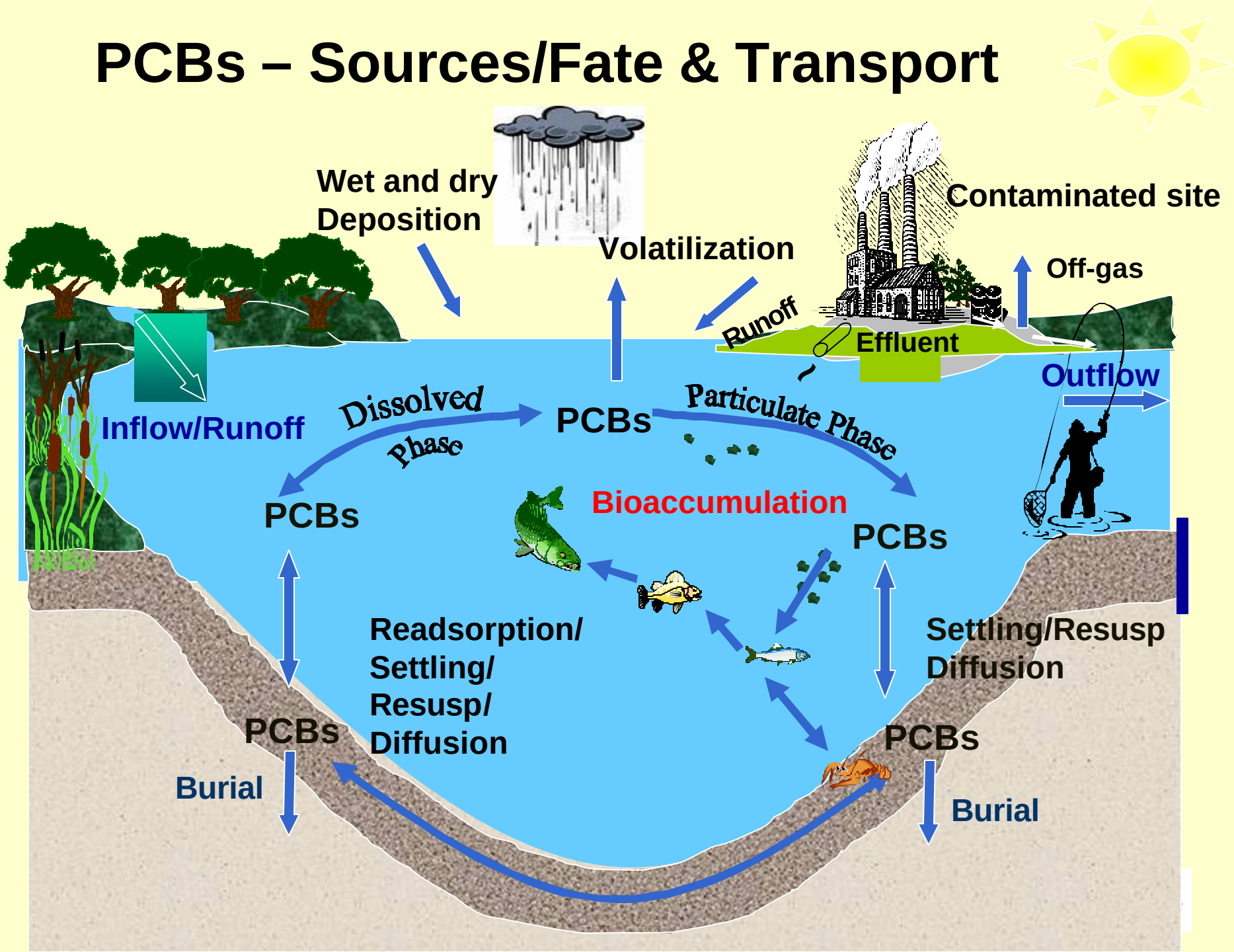
- Banned in late 70's
- Accumulate and persist in river sediments from historic releases
  - "Hot Spots"
- Generally not detected under VPDES Program

DEQ Virginia Department of Environmental Quality

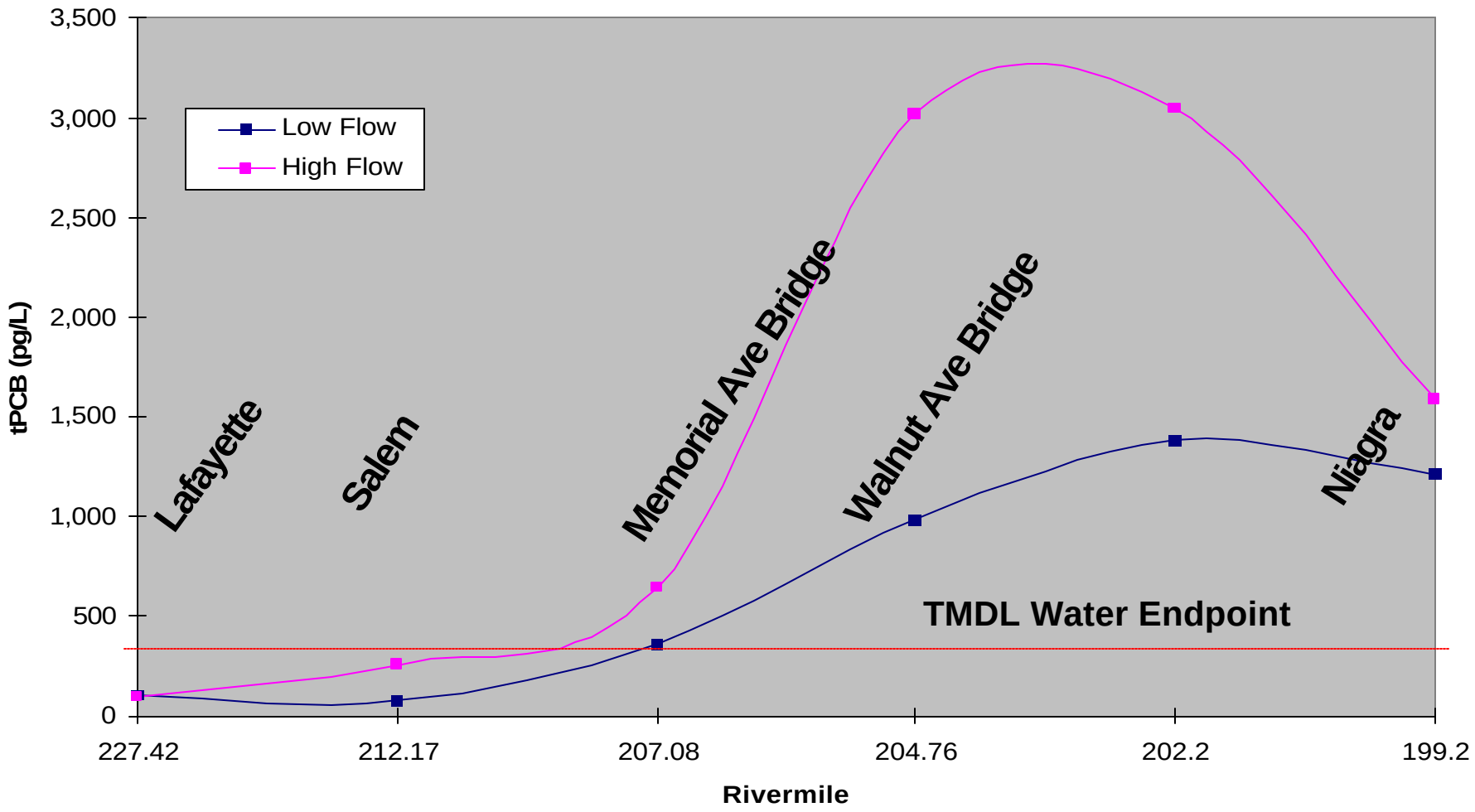
PCBs – Current Releases?

- PCBs used many years after banned
- Contaminated sites with active transport (non-point - e.g., CERCLA, RCRA, VRP, unknown)
- Point Sources
- Dielectric oils considered non PCB < 50 ppm
  - Fish advisories at 0.05 ppm
- Inadvertent production
  - Carbon + heat + chlorine
  - Up to 50 ppm allowed (TSCA)
- Atmosphere

PCBs – Sources/Fate & Transport



Roanoke River tPCBs
- Event Driven Releases -

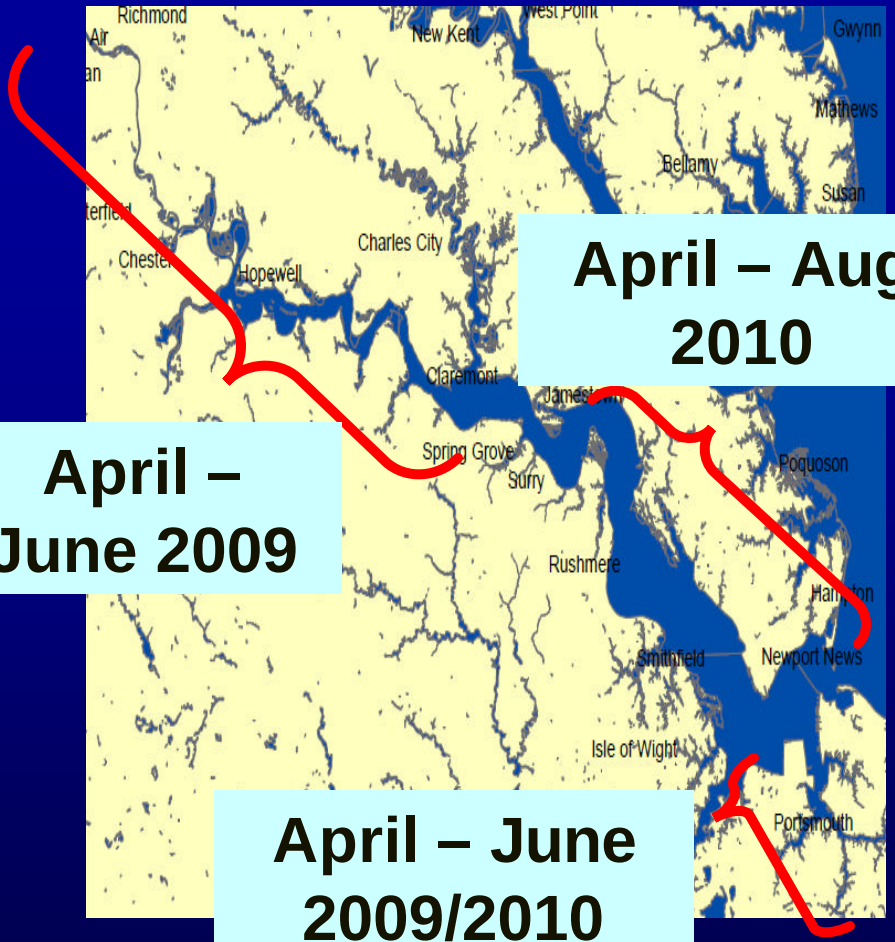


Questions?

DEQ Virginia Department of Environmental Quality

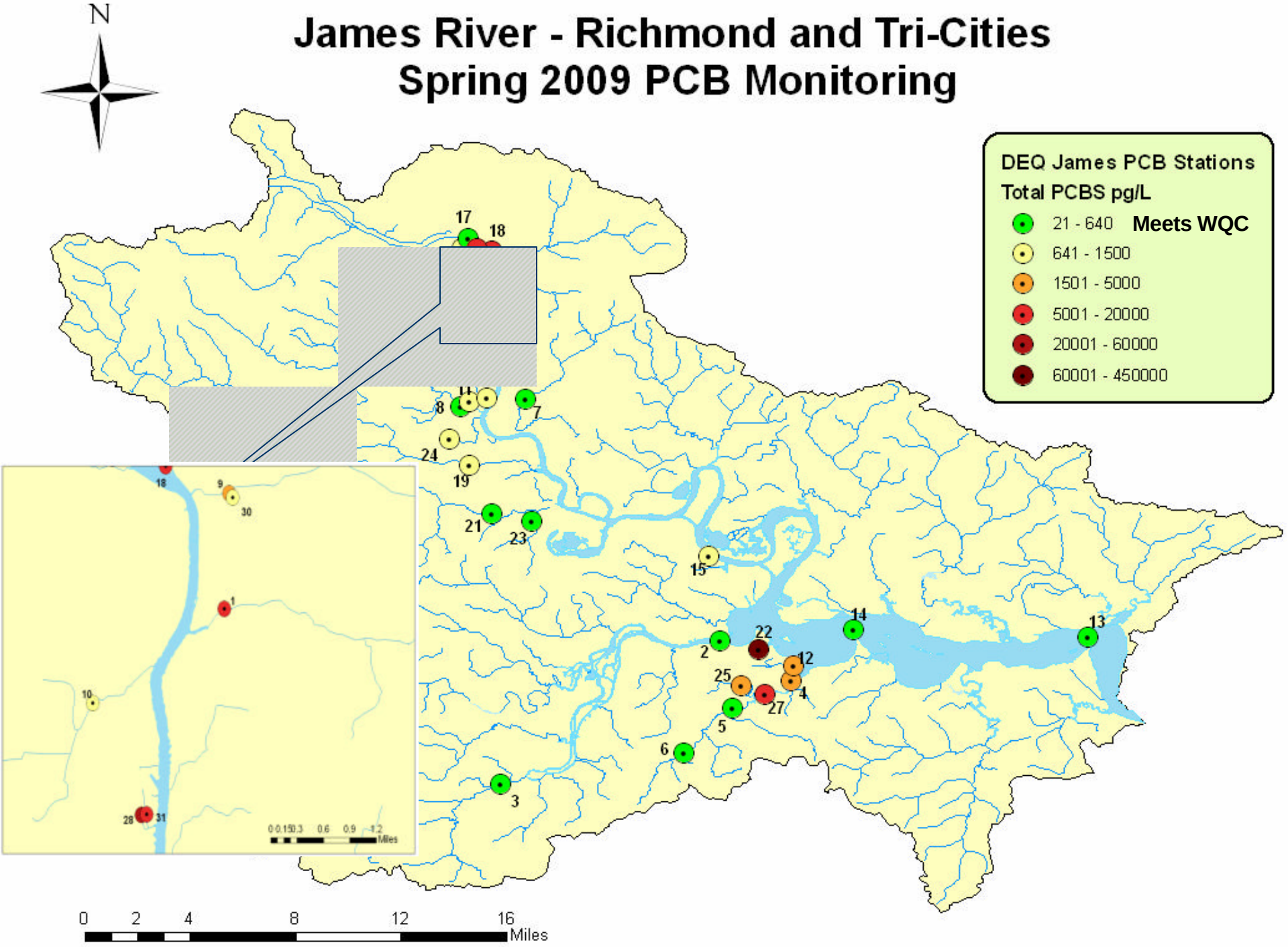
PCB Water Study

- Ambient Water samples
- Targeted wet and dry weather
- Used EPA Method 1668 for analysis
  - Low level detection method
- 2010 PCB Data pending



DEQ Virginia Department of Environmental Quality

James River - Richmond and Tri-Cities
Spring 2009 PCB Monitoring



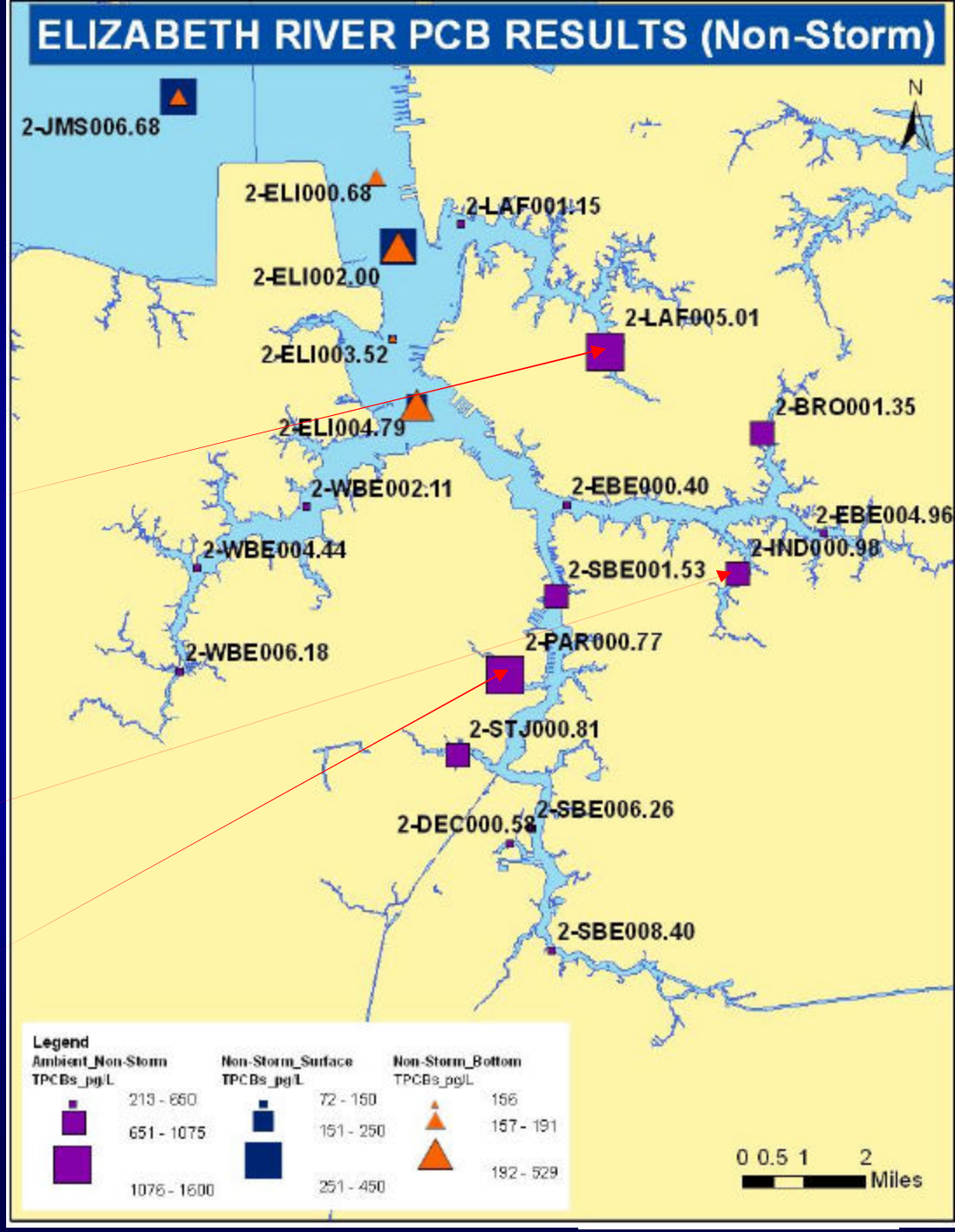
DEQ JAMES RIVER BASIN SPRING 2009 PCB SAMPLING LOCATIONS AND RESULTS (METHOD 1668B)

LEGEND #	STATION ID	STATION DESCRIPTION	STREAM NAME	TOTAL PCBS (pg/L)	AVG OF 2 SAMPLES
1	2-ALM000.42	Almond Creek at Rt. 5 bridge	ALMOND CREEK	5290	NO
2	2-APP001.53	BUOY 8 (CITY OF HOPEWELL)	APPOMATTOX RIVER	245	NO
3	2-APP012.79	RT. 36 BRIDGE	APPOMATTOX RIVER	398	NO
4	2-BLY000.65	RT. 10 BRIDGE	BAILEY CREEK	4091	NO
5	2-BLY003.42	BAILEY CREEK, RT. 156 BRIDGE	BAILEY CREEK	333	NO
6	2-BLY005.73	RT. 630 BRIDGE BELOW FORT LEE	BAILEY CREEK	300	NO
7	2-CEL001.56	Cornelius Creek at Mill Road	Cornelius Creek	21	NO
8	2-FAC000.85	Falling Creek at RT. 1 BRIDGE	FALLING CREEK	203	NO
9	2-GIL000.42	Gillie Creek at Williamsburg Ave. BRIDGE	GILLIE CREEK	2936	NO
10	2-GOD000.77	GOODE CREEK, COMMERCE ROAD	GOODE CREEK	965	NO
11	2-GRK000.35	Grindall Creek at Station Road	Grindall Creek	970	NO
12	2-GRV000.01	Gravelly Run 15 m above mouth at JMS	Gravelly Run	1684	NO
13	2-JMS066.88	WINDMILL PT, BUOY 86	JAMES RIVER	492	NO
14	2-JMS074.44	RT. 156 BRIDGE BELOW HOPEWELL	JAMES RIVER	214	NO
15	2-JMS087.01	BUOY 137	JAMES RIVER	1413	NO
16	2-JMS110.34	SOUTH BANK OF THE JAMES RIVER BELOW FALL	James River, Middle	843	NO
17	2-JMS110.44	NORTH BANK JAMES RIVER BELOW FALL ZONE R	James River, Middle	589	NO
18	2-KAN000.03	James R & Kanawha Canal @ Pear Street	Kanawha Canal	17993	NO
19	2-KSL002.62	Kingsland Creek at Rt. 1	Kingsland Creek	976	YES
20	2-MAN000.19	Manchester Canal DS Stockton StCSO 014	Manchester Canal	5061	NO
21	2-PCT002.46	Proctors Creek at RT. 1 BRIDGE	PROCTORS CREEK	130	NO
22	2-PTH000.42	Poythress Run at Station Str, Hopewell	Poythress Run	233484	NO
23	2-RDW000.50	Redwater Creek at Rt. 615, Coxendale Rd	Redwater Creek	462	NO
24	2-XSZ002.04	UT to James R (No Name Cr)	Unnamed tributary to James	704	NO
25	2-XYO000.03	UT to Cattail Cr off S 1st Ave @ culvert	UT to Cattail Creek (CTC)	3952	NO
26	2-XYS000.15	East Cr below Dupont Sp pond at USS I-95	UT to UT (XNU) to James	1012	NO
27	2CXAN000.08	UT Bailey Cr, aka Bear Cr 0.9mi US Rt 10	UT to Bailey Cr	8770	NO
28	Pond	pond next to Sims Metals	NULL	37760	YES
29	NELSON EL DITCH	Ditch below Nelson Electric OW Separator	DITCH SOUTHEAST OF NELSON ELECTRIC	434768	NO
30	RICHMONDCSO-028	RICHMOND CSO 28 to Gillies C, Wmsburg Rd	RICHMOND CITY CSO #028	982	NO
31	SIMSCR	South channel draining Sims Metals	SIMSCR	6988	YES

Non-Storm Data

Section	Station ID	Total PCBs (pg/L)
Main Stem	2-JMS006.68	449 / 191
	2-ELI000.68	130 / 184
	2-ELI002.00	345 / 529
	2-ELI003.52	72 / 156
	2-ELI004.79	214 / 510
Lafayette	2-LAF001.15	213
	2-LAF005.01	1,507
Western Branch	2-WBE002.11	218
	2-WBE004.44	311
	2-WBE006.18	243
Eastern Branch	2-EBE000.40	396
	2-EBE004.96	464
	2-IND000.98	1,066
	2-BRO001.35	896
Southern Branch	2-SBE001.53	854
	2-PAR000.77	1,089
	2-STJ000.81	849
	2-SBE008.40	231
	2-SBE006.26	416
	2-DEC000.58	565

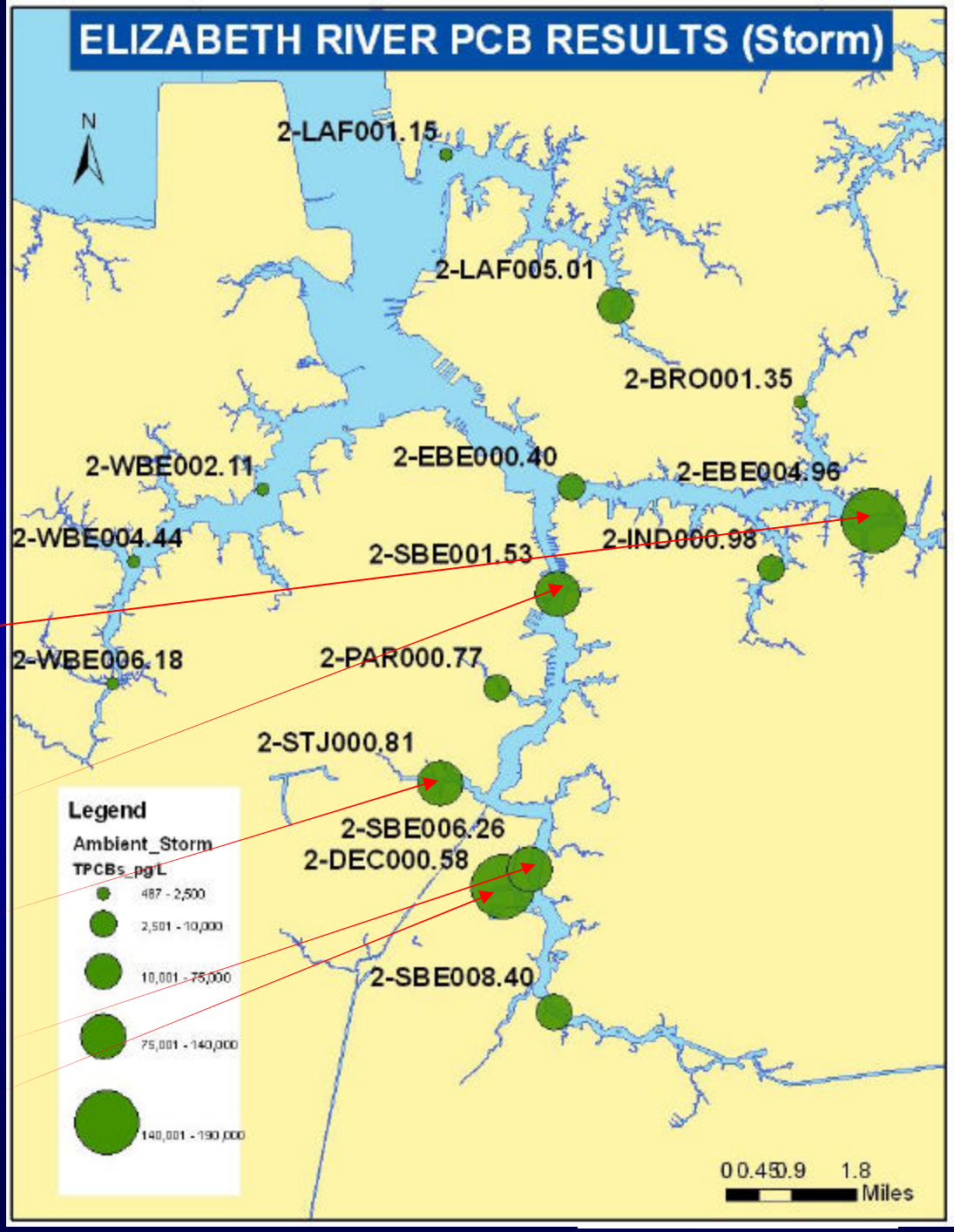
Proposed WQC = 640 pg/l



Storm Event Data

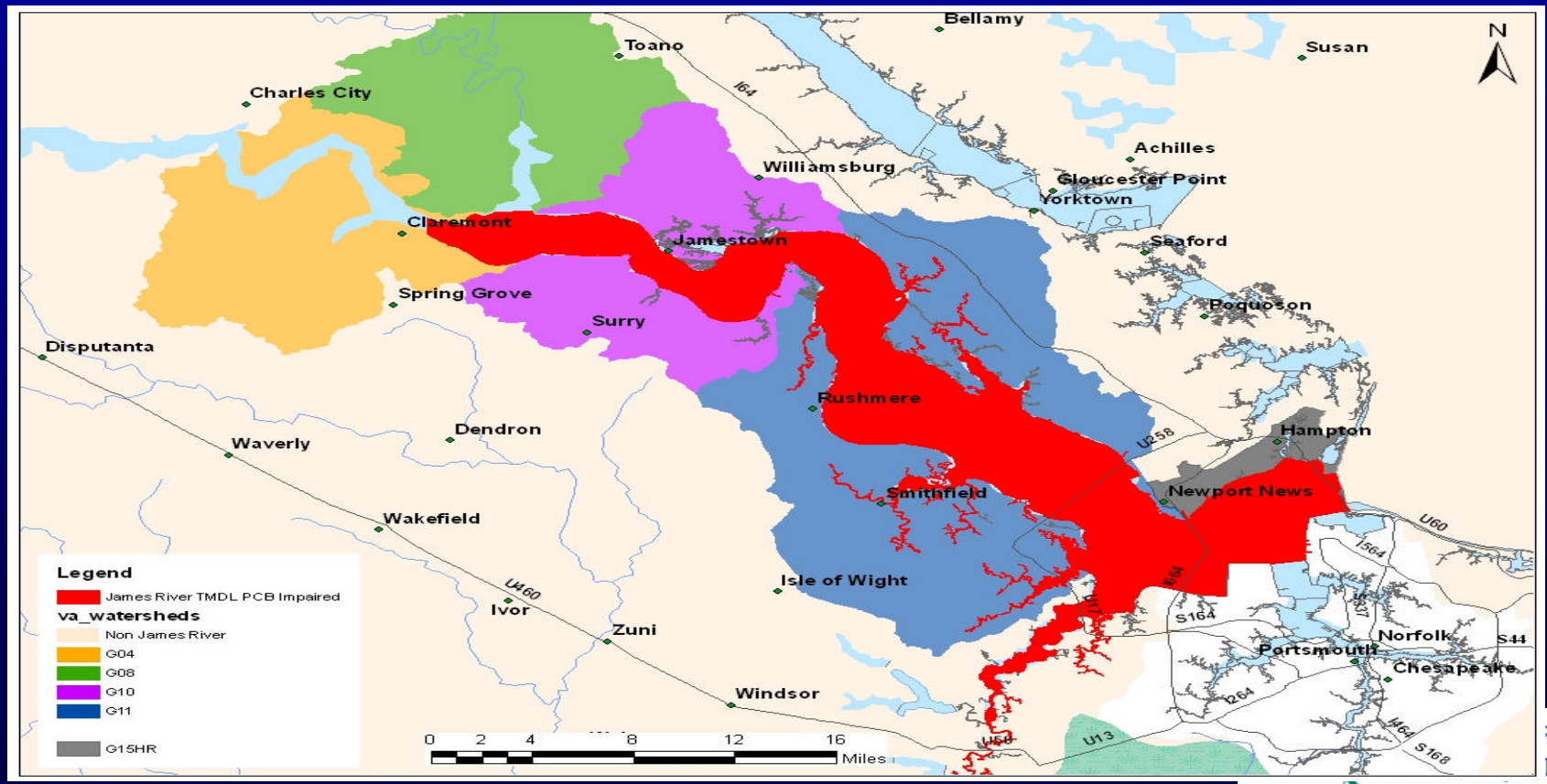
Section	Station ID	Total PCBs (pg/L)
Lafayette	2-LAF001.15	487
	2-LAF005.01	73,417
Western Branch	2-WBE002.11	906
	2-WBE004.44	696
	2-WBE006.18	580
Eastern Branch	2-EBE000.40	99,974
	2-EBE004.96	187,542
	2-IND000.98	2,513
	2-BRO001.35	1,035
Southern Branch	2-SBE001.53	100,054
	2-SBE001.53	5,339
	2-STJ000.81	109,085
	2-SBE008.40	72,461
	2-SBE006.26	121,053
	2-DEC000.58	140,182

Proposed WQC = 640 pg/l



Middle/Lower Tidal James River

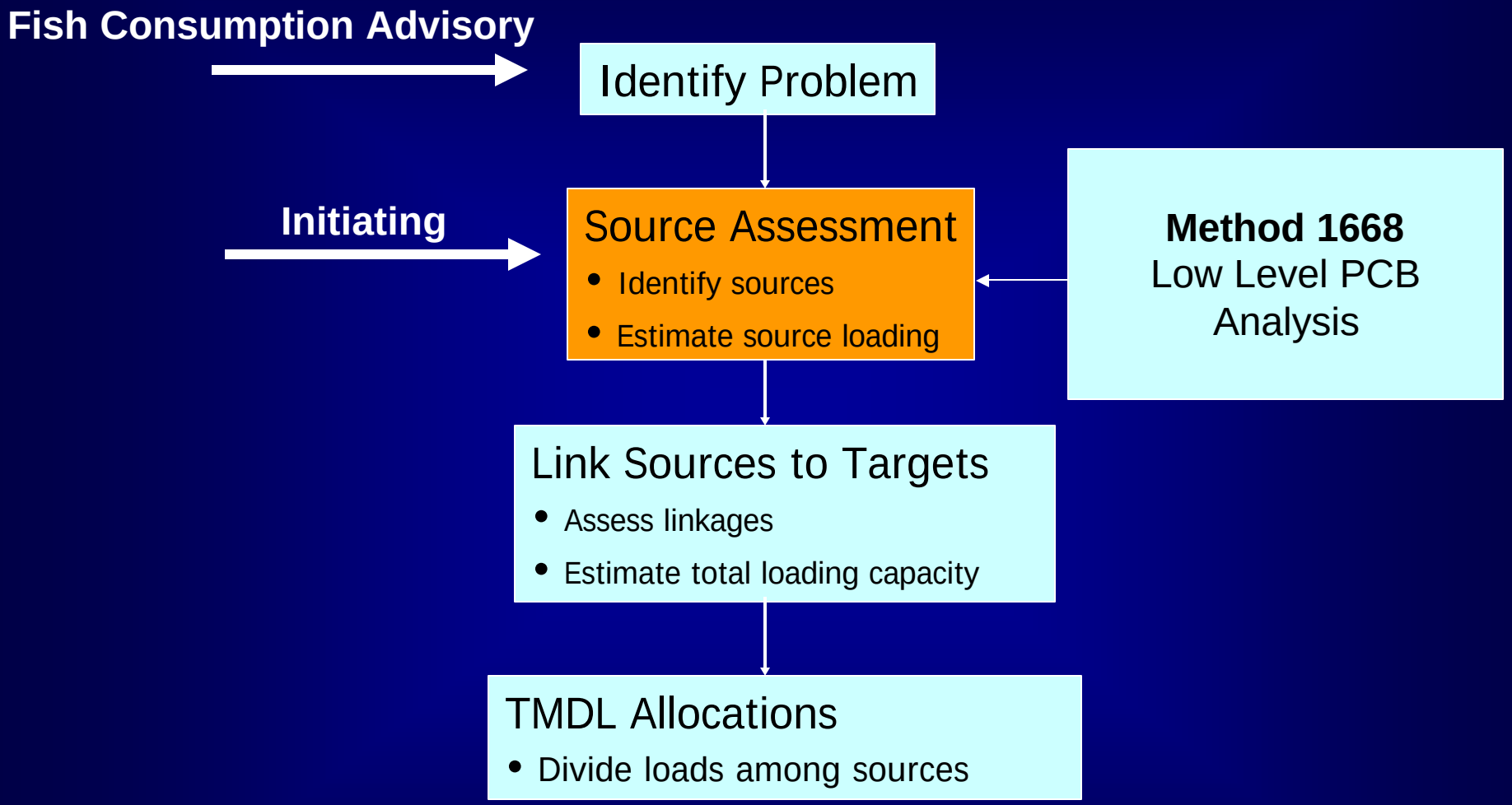
- 12 Stations
- PCB data pending (used for PCB Model)



Questions?

DEQ Virginia Department of Environmental Quality

Components of TMDL Study

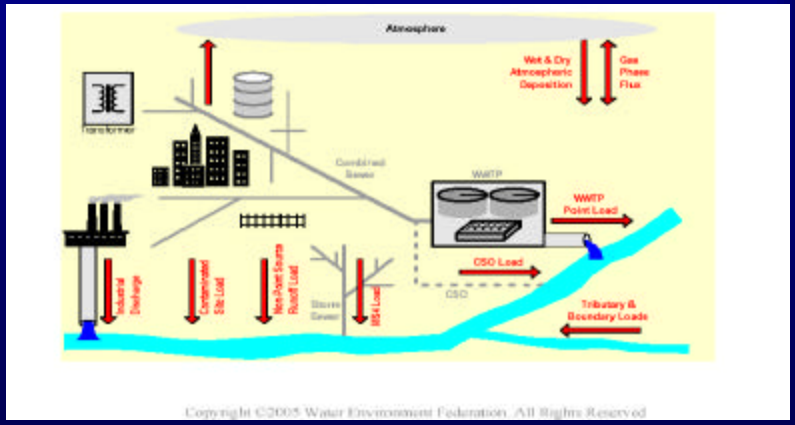


TMDL = Sum of WLA + Sum of LA + MOS

DEQ Virginia Department of Environmental Quality

TMDL Source Assessment
- Load Categories-

- Point Sources
  - WWTPs, Industry, Industrial SW, CSOs
  - MS4
- Non-Regulated Stormwater (Direct Drainage)
- Contaminated Sites
- Atmospheric Deposition
- River Sediment



DEQ Virginia Department of Environmental Quality

Point Sources

- TMDL requirements:
  - Baseline or existing load condition
  - Waste Load Allocations (WLAs)

$$\text{Baseline PCB Condition (g/yr)} = \left[\text{PCB conc. ng/L}\right] * \left[\text{Ave Flow (mgd)}\right] * \text{Conv. Factor}$$

$$\text{TMDL WLA (g/yr)} = \left[\text{PCB Endpoint conc. conc. ng/L}\right] * \left[\text{Design Flow (mgd)}\right] * \text{Conv. Factor}$$

DEQ Virginia Department of Environmental Quality

Point Sources

- Permitted dischargers generate PCB data under the VPDES Permit Program using EPA Method 608
- Typical Question
  - "PCBs have never been detected in my effluent"
- "Why are permitted dischargers being asked to collect additional PCB data?

DEQ Virginia Department of Environmental Quality

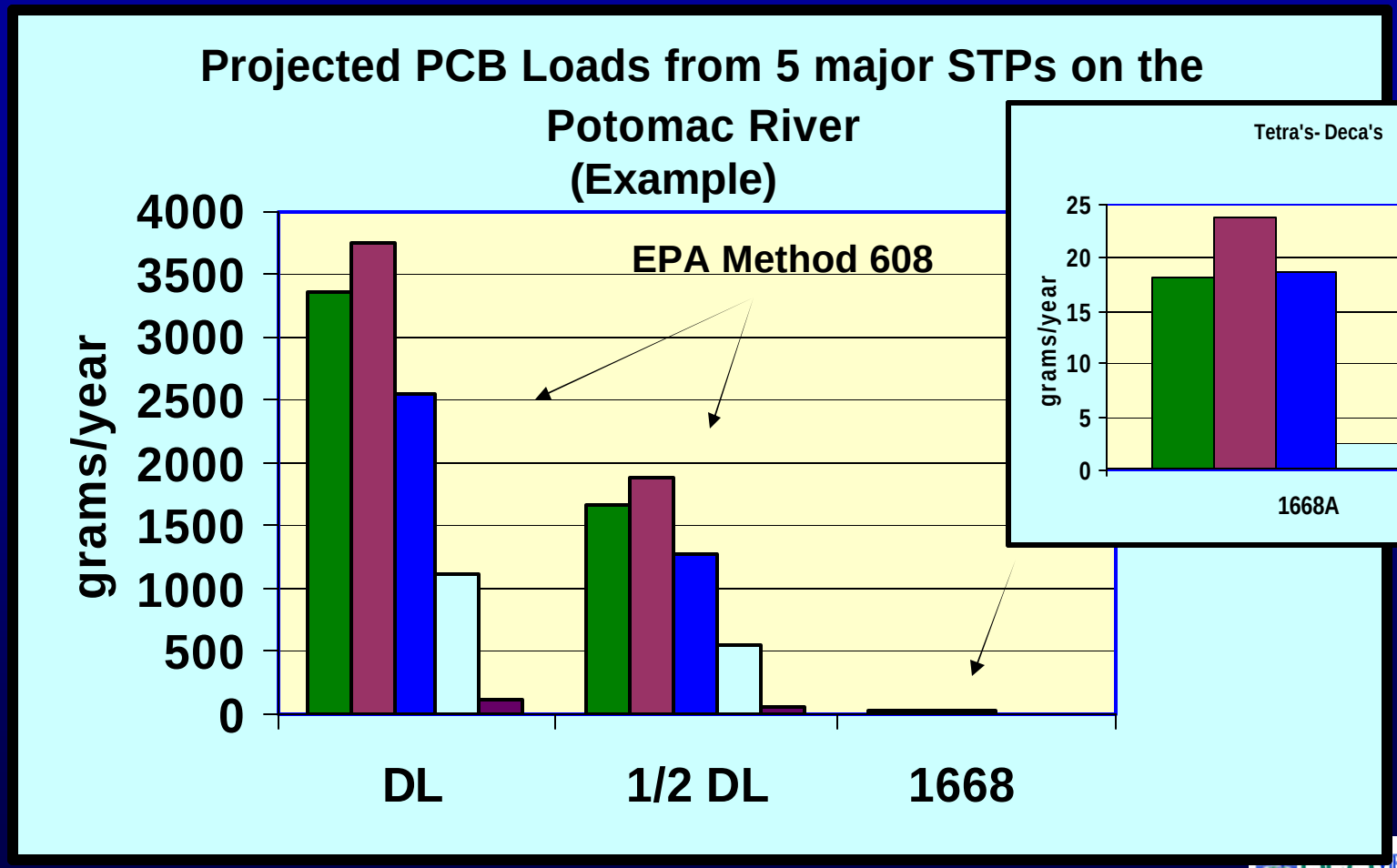
Point Sources

TMDL Need - Establish Baseline Loading

- EPA Method 608 (Permit method)
  - PCBs rarely detected (MDL = 0.065 µg/L; QL = 0.5 µg/L) tPCB WQC = 0.00064 µg/L
  - Reported as Aroclors
- Options
  - No data = no load?
    - Not an option: existing load required by TMDL
  - Use assumptions (Method QL, DL, default)
  - Generate low level PCB data

DEQ Virginia Department of Environmental Quality

Assumptions vs. Real Data



Virginia Department of Environmental Quality

PCB Analytical Method

- EPA Method 1668
  - High Resolution Gas Chromatography/ High Resolution Mass Spec
  - Analyzes 209 Congeners
  - Detection ≤ 5 pg/L per congener
  - Targets PCB concentrations that are relevant to fish

DEQ Virginia Department of Environmental Quality

Questions?

DEQ Virginia Department of Environmental Quality

Guidance for Monitoring of Point Sources for TMDL Development Using Low Level PCB Method 1668

March 2009

http://www.deq.virginia.gov/tmdl/pcb.html

DEQ Virginia Department of Environmental Quality

Need for PCB Monitoring Guidance

- All areas of the Commonwealth lacking PCB water data (ambient and effluent)
- DEQ has insufficient funding to perform PCB analysis for TMDL source categories
- Asks permit holders to generate the data
  - Provides a consistent, technical approach
  - Enables DEQ to focus on performing ambient water and sediment PCB analysis
    - Used for source assessment
    - Model fate and transport of PCBs

DEQ Virginia Department of Environmental Quality

Point Source PCB Monitoring Guidance

Purpose is to establish procedures for implementing point source monitoring of PCBs in support of TMDL development.

~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~

Originated from data needs on the Potomac PCB TMDL. Similar to efforts used in New York (Panero *et al*., 2005), Delaware and New Jersey (DRBC 1998)

http://www.nyas.org/programs/harbor.asp

http://www.state.nj.us/drbc/regs/pcb-new.pdf

VIRGINIA DEPARTMENT OF ENVIRONMENTAL QUALITY

Guidance Developmental History

2006 - DEQ Internal Development

2007 thru 2008 –

Technical Advisory Committee: Bluefield STP, City of Richmond, Dominion Resources, DCR, DMME, HRPDC, Navy, Southern Environmental Law Center, UOSA, U.S. Fish & Wildlife, VAWMA, VMA, Western VA Water Authority (6 meetings)

DEQ Internal Review (ongoing)

EPA Region III review (Fall 2008)

2009 - Finalized

DEQ Virginia Department of Environmental Quality

Guidance Document Outline

I. Introduction
II. Background
III. Authority
IV. Definitions
V. Procedure
   A. Facilities identified for monitoring
   B. Monitoring frequency
   C. Sample collection and analytical requirements
   D. Analytical laboratories
   E. PCB reporting requirements
   F. References
VI. Appendices

DEQ Virginia Department of Environmental Quality

VADEQ RO Identifies Facilities Considered for PCB Monitoring (per Guidance)

- Major (including CSOs) & minor municipals
- Industrial facilities (specific SIC codes)
- Industrial stormwater dischargers under individual or general permits (SIC codes)
  - Exemptions (case by case basis)
    - Minor municipals – document not a source
    - SW through a POTW or CSO or “no exposure”
    - Representative or identical outfalls
    - DEQ does not regulate MS4s (DCR)
      - Provides framework for PCB monitoring

DEQ Virginia Department of Environmental Quality

Monitoring Frequency

Base flow (dry) and storm flow (wet) needed for load characterization

VPDES Facility				
Municipals		**Industrials**		
Major ≥ 1 MGD	**Minor < 1 MGD**	**Process wastewater only**	**Process wastewater with storm water**	**Storm water only**
2 wet + 2 dry	**1 wet + 1 dry**	**2 samples (storm event sampling not required)**	**1 dry + 1 wet**	**2 wet**

DEQ Virginia Department of Environmental Quality

PCB Guidance Appendices

- Appendix C
  - Sampling options & “clean technique” protocol
- Appendix D
  - Analytical Requirements (EPA Method 1668)
  - Approved list of laboratories on website
- Appendix E
  - Data Submittal Requirements

DEQ Virginia Department of Environmental Quality

Approved Laboratories

- Lesson learned:
  - If analysis is not performed in accordance with requirements specified in Appendix D, not worth running the analysis
    - Reporting levels not met
- Cost containment
  - Opportunity for partnerships or coordinate with lab
    - Samples run in batches of 20
    - Samples can be held under the proper conditions up to one year.

DEQ Virginia Department of Environmental Quality

Email: Mark Richards

Main Menu
- TMDL Home
- TMDL development
- TMDL implementation
- Geospatial data
- Chesapeake Bay TMDL
- Chesapeake Bay and VA Waters Clean-Up Plan
- No Discharge Zone designations
- PCB TMDLs
- TMDL ad hoc committee
- Additional information
- DEQ water programs

Resources for PCB TMDLs

- March 9 and 11, 2010: Information meeting on PCB Impairments in the Blue Ridge Region
  - Meeting summary
  - Monitoring for PCBs for TMDL Development and Implementation
  - PCB Impairments (map)
- **Elizabeth River PCB TMDL Development**
  - November 5, 2009 meeting summary
- **James River PCB TMDL Development**
- **Guidance for Monitoring of Point Sources for TMDL Development Using Low-Level PCB Method 1668**
- **The VDEQ issued a statewide strategy in January 2005 to address PCB contamination in the waters of the Commonwealth: PCB Strategy Report**
- **PCB Laboratories**
- **Advisory Committee Meeting and PCB Guidance Materials**
- **Electronic Deliverable Data (EDD) files available for download in accordance with the PBC Point**

Questions?

Presentation & PCB Guidance Available at
http://www.deq.virginia.gov/tmdl/pcb.html

Mark.richards@deq.virginia.gov

DEQ Virginia Department of Environmental Quality

Extra Slides

PCB TMDL Implementation

- If baseline PCB load exceeds the TMDL WLA:
  - BMP WQBELs (40 CFR 122.44(k))
    - Numeric effluent limits considered infeasible
    - EPA accepted approach on Potomac & Roanoke River PCB TMDLs
  - Pollutant Minimization Plan
  - Adaptive Implementation
    - Objective to back-track source and not treat at end of pipe

DEQ Virginia Department of Environmental Quality